

Atomic Energy of Canada Limited

Report presented to the Board of Directors

5 September 2007

Special Examination Report

Office of the Auditor General of Canada
Bureau du vérificateur général du Canada

Office of the Auditor General of Canada
Bureau du vérificateur général du Canada

28 August 2007

To the Board of Directors of
Atomic Energy of Canada Limited

We have completed the special examination of Atomic Energy of Canada Limited in accordance with the plan presented to the Audit Committee of the Board of Directors on 16 November 2006. As required by Section 139 of the *Financial Administration Act* (FAA), we are pleased to provide to you the attached final special examination report.

We would like to draw your attention to a significant deficiency related to the unresolved strategic challenges that the Corporation faces. More information can be found in the report.

Pursuant to Section 140 of the FAA, it is our view that this report contains information that should be brought to the attention of the Minister of Natural Resources. Accordingly, following consultation with the Board, we will be forwarding a copy of the report to the Minister.

We will be pleased to respond to any questions that you may have concerning our report at your meeting on 5 September 2007.

I would like to take this opportunity to express our appreciation to the Board members, management, and the Corporation's staff for the excellent cooperation and assistance offered to us during the examination.

Yours sincerely,



Nancy Y. Cheng, FCA
Assistant Auditor General

Attach.

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Atomic Energy of Canada Limited
Special Examination Report—2007

Main Points

What we examined

Atomic Energy of Canada Limited (AECL) is a federal Crown corporation that reports to Parliament through the Minister of Natural Resources. Responsible for most nuclear research and development in Canada, it also designs and sells nuclear power reactors and other products and provides related services to nuclear utilities worldwide. Those services include research and development support, construction management, waste management, and decommissioning in support of CANDU reactor products. AECL also produces a significant portion of the world's requirement of medical isotopes.

Although AECL was established under the *Atomic Energy Control Act*, its mandate is not defined in an Act of Parliament. It manages its operations through its Corporate Plan, which the government approves annually. AECL does not have borrowing powers and must obtain the government's approval for certain key decisions, such as investments in capital assets or decisions that require government funding.

Our special examination of AECL looked at the systems and practices we considered essential to providing the Corporation with reasonable assurance that its assets are safeguarded and controlled, its resources are managed economically and efficiently, and its operations are carried out effectively. Among the areas of AECL that we examined were governance, risk management, research and development, product and service management, and the Corporation's environmental and sustainable development practices. We did not do a technical assessment of the safety and security of the Corporation's nuclear research facilities or waste management practices, as they are monitored by the Canadian Nuclear Safety Commission. Nor did we assess any of the technical design aspects of the Corporation's products and services, whether nuclear or non-nuclear.

Why it's important

AECL operates in a complex environment. As a Crown corporation, it has not only commercial objectives but also a public policy role, which includes sustaining and enhancing nuclear technology to safely and securely support Canada's nuclear energy supply—CANDU reactors

supply about 16 percent of Canada's electricity. AECL's research also supports nuclear non-proliferation, nuclear medicine, environmental initiatives, and basic scientific research in various industries including agriculture and non-destructive testing. In addition, AECL is a major producer of medical isotopes for the diagnosis and treatment of disease. The Corporation is also responsible for managing the federal government's nuclear wastes and legacy obligations.

In a highly regulated nuclear industry, AECL must work diligently to comply with standards and regulations set by regulatory bodies in Canada and abroad. At the same time, it needs to capitalize on the emerging nuclear market, attract new business, and replace some of its aging facilities. AECL's ability to succeed depends on how effectively it safeguards and controls its assets, manages its resources, and carries out its operations.

What we found

Our examination found a significant deficiency with respect to the risk that the Corporation may be unable to resolve three strategic challenges that, in particular, entail long-term funding requirements and that together would impair its ability to achieve its mandate. These challenges are the completion and licensing of the Dedicated Isotope Facility (DIF), the development and licensability of the Advanced CANDU Reactor (ACR) in time for the market requirement, and the replacement of aging facilities at Chalk River Laboratories (CRL):

- **Dedicated Isotope Facility.** In 1996, AECL signed a contract with a customer to develop and construct two 10 MW Maple reactors and a new processing facility at the Chalk River Laboratories to produce medical isotopes. AECL originally planned to produce isotopes after a four-year development and construction period at the new Facility. Completion of the two reactors has been delayed and the contract re-negotiated, with completion of the two reactors now expected in 2008 and 2009. As at 31 March 31 2007, significant investments were still needed to complete the Facility. Moreover, the Canadian Nuclear Safety Commission, AECL's regulator, has identified technical compliance issues that AECL has yet to fully resolve.
- **Advanced CANDU Reactor.** AECL's ability to market nuclear power reactors domestically and abroad depends on its ability to fund and develop the next-generation CANDU reactor, the ACR. Initially, AECL planned to develop an ACR 700 MW reactor for the US market, with an in-service date of 2011. Market conditions changed in 2005 and, to meet Canadian market

requirements, the Corporation changed its design product to an ACR 1000 MW reactor, with an in-service date of 2016. The design change, more stringent licensing requirements, and enhanced project management approach resulted in a significant increase in the cost estimates. As at 31 March 2007, costs to complete the ACR were estimated at $400 million. In addition, the Canadian Nuclear Safety Commission withdrew its service of providing pre-licensing assessments for AECL, citing resource constraints. The loss of this pre-licensing statement puts AECL at a competitive disadvantage in marketing the ACR.

- **Aging facilities at Chalk River.** Some of the building infrastructure at CRL is 50 to 60 years old, well past the end of its originally intended useful life. AECL has indicated that it will cost $600 million in the next 5 years (about $850 million over 10 years) to replace or refurbish this infrastructure. Over the past 5 years, the government has provided $34 million to address urgent health, safety, security, and environmental issues. A source of funding for the other significant costs has not yet been identified.

In other areas, we found no significant deficiencies in the systems and practices that we examined. We noted that AECL has improved its practices in a number of areas since our last examination in 2002, as outlined below, and we have made some recommendations to help it improve further.

- AECL has adequate systems and practices for managing current nuclear wastes. It uses adequate procedures in its waste management and decommissioning projects. It now has a unit responsible for managing all such projects at the Chalk River site, using industry practices. Its 70-year strategy for decommissioning the Chalk River site has been accepted by the Canadian Nuclear Safety Commission as a sound basis for the eventual decommissioning of the CRL site. The Corporation has secured funding from the federal government for the first five years of the strategy; the source of funding beyond 2011 has not been secured.

- AECL has systems and practices to keep track of its compliance with the environmental regulations to which it is subject. We noted two cases of non-compliance with license conditions between February and October 2006, which the Corporation corrected in a timely manner. Environmental monitoring in 2004 and 2005 showed that radioactive emissions were well below regulatory limits at its Chalk River and Whiteshell sites.

- We found that since our last special examination, AECL has made substantial overall progress in risk management. It has also begun the process of developing an Enterprise Risk Management (ERM) Framework, including an exercise it carried out to identify risks corporate-wide. However, that exercise did not consider the numerous risk management processes already in place throughout the organization, and there is no action plan for aligning all the Corporation's processes and implementing its ERM Framework. Substantial effort, strong leadership, and direction from senior management, as well as the Board's support, will be needed to achieve the stated goal of implementing an appropriate ERM framework.
- AECL recognizes the importance of entering into partnerships to help its competitive position and recently signed strategic alliance agreements to promote CANDU technology. We found that there was no formal framework to identify both the opportunities and the risks of partnerships or to establish and monitor such agreements. Although, the Board has been given information from time to time about prospective alliances, it lacks an opportunity to review them in a holistic way and approve them.

AECL has responded. *In general, the Corporation agrees with our recommendations. Its responses follow the recommendations throughout the report.*

To: The Board of Directors of Atomic Energy of Canada Limited

Special Examination Opinion

1. Under Part X of the *Financial Administration Act* (FAA), the Atomic Energy of Canada Limited is required to maintain financial and management control and information systems and management practices that provide reasonable assurance that its assets are safeguarded and controlled; its financial, human, and physical resources are managed economically and efficiently; and its operations are carried out effectively.

2. The FAA also requires the Corporation to have a special examination of these systems and practices carried out at least once every five years.

3. Our responsibility is to express an opinion on whether there is reasonable assurance that during the period covered by the examination—from September 2006 to March 2007—there were no significant deficiencies in the systems and practices we examined.

4. We based our examination plan on a survey of the Corporation's systems and practices, which included a risk analysis. We presented the plan to the Audit Committee of the Board of Directors on 16 November 2006. The plan identified the systems and practices that we considered essential to providing the Corporation with reasonable assurance that its assets are safeguarded and controlled, its resources managed economically and efficiently, and its operations carried out effectively. Those are the systems and practices that we selected for examination.

5. The plan included the criteria that we selected specifically for this examination in consultation with the Corporation. The criteria were based on our experience with performance auditing. Our choice of criteria was also influenced by legislative and regulatory requirements, professional literature and standards, and practices followed by the Corporation and other organizations. (The systems and practices we examined and the criteria we used are listed in Appendix A.)

6. We did not do a technical assessment of the safety and security of the Corporation's nuclear research facilities or waste management practices. Such an assessment is carried out by the Canadian Nuclear Safety Commission, as part of its regulatory mandate. Nor did we assess

any of the technical design aspects of the Corporation's products and services, whether nuclear or non-nuclear.

7. We conducted our examination in accordance with our plan and with the standards for assurance engagements established by The Canadian Institute of Chartered Accountants. Accordingly, it included the tests and other procedures we considered necessary in the circumstances. In carrying out the special examination, we relied on internal audits of quality assurance.

8. During our special examination, we noted a significant deficiency with respect to the risk that the Corporation may be unable to resolve three strategic challenges that, in particular, entail long-term funding requirements and that together would impair its ability to achieve its mandate. These challenges are the completion and licensing of the Dedicated Isotope Facility (DIF), the development and licensability of the Advanced CANDU Reactor (ACR) in time for the market requirement, and the replacement of aging facilities at Chalk River Laboratories (CRL):

- **Dedicated Isotope Facility.** In 1996, AECL signed a contract with a customer to develop and construct two 10 MW Maple reactors and a new processing facility at the Chalk River Laboratories to produce medical isotopes. AECL originally planned to produce isotopes after a four-year development and construction period at the new Facility. Completion of the two reactors has been delayed and the contract re-negotiated, with completion of the two reactors now expected in 2008 and 2009. As at 31 March 2007, significant investments were still needed to complete the Facility. Moreover, the Canadian Nuclear Safety Commission, AECL's regulator, has identified technical compliance issues that AECL has yet to fully resolve.

- **Advanced CANDU Reactor.** AECL's ability to market nuclear power reactors domestically and abroad depends on its ability to fund and develop the next-generation CANDU reactor, the ACR. Initially, AECL planned to develop an ACR 700 MW reactor for the US market, with an in-service date of 2011. Market conditions changed in 2005 and, to meet Canadian market requirements, the Corporation changed its design product to an ACR 1000 MW reactor, with an in-service date of 2016. The design change, more stringent licensing requirements, and enhanced project management approach resulted in a significant increase in the cost estimates. As at 31 March 2007, costs to complete the ACR were estimated at $400 million. In addition,

the Canadian Nuclear Safety Commission withdrew its service of providing pre-licensing assessments for AECL, citing resource constraints. The loss of this pre-licensing statement puts AECL at a competitive disadvantage in marketing the ACR.

- **Aging facilities at Chalk River.** Some of the building infrastructure at CRL is 50 to 60 years old, well past the end of its originally intended useful life. AECL has indicated that it will cost $600 million in the next 5 years (about $850 million over 10 years) to replace or refurbish this infrastructure. Over the past 5 years, the government has provided $34 million to address urgent health, safety, security, and environmental issues. A source of funding for the other significant costs has not yet been identified.

9. In our opinion, noting the scope limitations and based on the criteria established for the examination, there is reasonable assurance that there were no significant deficiencies in the systems and practices we examined except for the significant deficiency described in the preceding paragraph.

10. The rest of this report provides an overview of the Corporation and our other findings and recommendations from the examination.

Sheila Fraser

Sheila Fraser, FCA
Auditor General of Canada

Ottawa, Canada
30 March 2007

Overview of Atomic Energy of Canada Limited

Background

11. Atomic Energy of Canada Limited (AECL) was incorporated in 1952 under the *Canada Corporation Act* (and continued under the *Canada Business Corporation Act)*, pursuant to the powers of the Minister of Natural Resources under the *Nuclear Energy Act*. The Corporation is a Schedule III Part I Crown corporation under *the Financial Administration Act* (FAA) and an agent of Her Majesty the Queen in Right of Canada. As a result, AECL's liabilities are ultimately liabilities of Her Majesty the Queen in Right of Canada. AECL receives funding from the Government of Canada and is exempt from income taxes in Canada. It reports on its activities to Parliament through the Minister of Natural Resources.

12. Over the years, the Corporation has evolved from solely a research and development facility to a designer and vendor of nuclear power reactors as well. AECL is an integrated nuclear technology and services company that provides services to nuclear utilities worldwide. It is responsible for most nuclear research and development in Canada and supports all aspects of the life cycle of the Canada deuterium uranium (CANDU) power reactor. This includes design and construction, services, life extension, decommissioning, and waste management. The Corporation also produces a significant portion of the world requirements of medical isotopes and manages its nuclear waste obligations.

13. AECL employs more than 4,000 staff in a wide range of professional and technical disciplines. The staff include nuclear operators, scientists, engineers, and technicians located at its nuclear laboratories in Chalk River, Ontario, and Whiteshell, Manitoba (decommissioning currently underway), at its headquarters in Mississauga, and at its offices in Ottawa and Montreal.

Mandate of the Corporation

14. Since AECL was established under the *Canada Corporations Act* (and continued under the *Canada Business Corporation Act)*, its mandate is not defined in an Act of Parliament. AECL manages its operations through its Corporate Plan, which the government approves annually. It does not have borrowing powers and must obtain the government's approval for certain key decisions, such as investments in capital assets or decisions requiring government funding. The Corporation's current mandate as set out in its latest approved Corporate Plan combine two roles.

1. The public policy role of AECL includes

- sustaining and enhancing nuclear technology to safely and securely support Canada's nuclear energy supply and other applications of nuclear technology, and
- managing nuclear wastes and legacy liabilities.

2. The commercial role of AECL is to maximize the return to Canada on the investment in nuclear technology by supplying innovative products and services.

15. These two roles are reflected in the Corporation's mandate statement as follows: AECL will create customer and shareholder value through

- managing the Canadian nuclear platform responsibly and cost-effectively,
- leveraging the technology base to deliver nuclear products and services to market, and
- paying dividends from profitable growth.

Vision of the Corporation

16. AECL's vision is to

- be the top worldwide nuclear products and services company;
- protect the health and safety of the public, its employees, and the environment; and
- minimize nuclear legacy obligations for future generations.

Corporate objectives and strategies

17. To fulfill its mandate and vision, the Corporation has identified the following strategic objectives and strategies:

- Achieve leadership in its markets through performance excellence and business relationships.
- Demonstrate vigilance and leadership in health, safety, the environment, and operational excellence.
- Lead technology development and application to continuously improve CANDU life cycle performance.

Business and operating environment

18. The Corporation's business. AECL is the designer of the CANDU technology and custodian of the nuclear option for Canada. On a commercial basis, it designs, markets, and manages the construction of nuclear power reactors and supplies reactor services to global clients. These services include nuclear products, engineering services, and major refurbishment of reactors. The Corporation also produces medical isotopes, and it advances Canada's nuclear technology through applied nuclear research and development.

19. AECL has built more than 30 reactors in five different countries. In the last 10 years, it has sold 3 CANDU reactors to international clients and undertaken major refurbishment or retubing contracts. According to AECL, the outlook for the nuclear industry is more promising now than it has been in several decades. A number of factors explain this situation: the growing demand for electricity, the relative price increase of other electricity-generating options, the fact that nuclear electricity production produces limited greenhouse gas emissions, the growing support for the nuclear industry worldwide, and the aging of existing reactors.

20. In addition to building new plants and refurbishing existing plants, AECL's Services Business Unit has a continual stream of smaller contracts (totalling about $100 million in 2006–07) to assist all of the operating CANDU reactors. Activities in this business line range from the supply of scientific and engineering analysis to the manufacture, testing, and assembly of nuclear equipment.

21. **Advanced CANDU Reactor.** Since 2001–02, AECL has been developing the next-generation CANDU reactor, the Advanced CANDU Reactor (ACR). According to AECL, the ACR is designed to be built and operated at a lower cost and with less nuclear waste output than other existing nuclear power reactors.

22. **Nuclear platform.** The nuclear platform comprises research and development and its related infrastructure, as well as waste management and decommissioning obligations.

23. **Chalk River Laboratories.** The activities of the nuclear platform are conducted primarily at the Chalk River Laboratories (CRL); these include various facilities that are used to conduct research and development to support the existing CANDU reactors and the advancement of the ACR technology. In its Corporate Plan, AECL notes that some of these facilities are 50 to 60 years old and require upgrades and maintenance to meet health and safety standards, attract employees, and allow research and development to continue. The Corporation is currently having discussions with Natural Resources Canada about the funding needed for CRL.

24. The Chalk River Laboratories include the National Research Universal (NRU) reactor, which AECL uses for its own research and development activities and the National Research Council (NRC) uses to investigate and study (non-destructively) all types of industrial and biological materials. The NRU reactor is also used for producing medical isotopes. AECL is supporting the NRC in refurbishing or

replacing the NRU reactor, which is nearing the end of its useful life. In 1996, AECL undertook a project to construct two 10 MW MAPLE reactors and a new processing facility at the Chalk River Laboratories for one of its customers. This facility, known as the Dedicated Isotope Facility (DIF), was designed to replace the NRU reactor in the production of isotopes for the health industry.

25. In June 2006, the Canadian Nuclear Safety Commission (CNSC) renewed AECL's licence for the NRU reactor and the Chalk River Laboratories until 2011. The licence requires the Corporation to take a number of actions during the licensed period.

26. AECL manages wastes produced by its various facilities. It also manages most of the other nuclear waste for which the Government of Canada is responsible—wastes from medical producers, and low-level radioactive waste from hospitals and universities.

27. **Operating changes.** In the last five years, the Corporation has reorganized its operations in three main segments—Commercial Operations, Technology, and Liability Management Unit—to increase transparency and accountability. It has also introduced transfer pricing mechanisms to account for transactions between the various segments.

28. Management has also introduced several culture change initiatives to align employees with customers, to ensure operational excellence, and to promote safety. These initiatives also focus on a quality culture, with the creation of the position of chief quality officer in 2002. Other tools, such as a revised performance assessment process and entity-wide training, were rolled out in support of these initiatives.

Findings and Recommendations

29. Based on our examination, we concluded that, noting the scope limitations in paragraph 6 about technical assessment and design aspects, there is reasonable assurance that there were no significant deficiencies in the systems and practices we examined, except for the significant deficiency described below

Significant deficiency—unresolved strategic challenges

30. A significant deficiency is one that prevents, or puts at material risk, the organization's ability to achieve one or more of its statutory control objectives—to safeguard and control its assets, to manage its resources economically and efficiently, and to carry out its operations effectively—in support of its mandate.

31. During our special examination, we noted a significant deficiency: the risk to AECL's ability to achieve its mandate due to unresolved strategic challenges that, in particular, entail long-term funding requirements. These challenges are the completion and licensing of the Dedicated Isotope Facility (DIF), the development and licensability of the Advanced CANDU Reactor (ACR) in time for the market requirement, and the replacement of aging facilities at Chalk River Laboratories (CRL).

32. **Completion and licensing of the Dedicated Isotope Facility.** In 1996, AECL undertook a project to construct two 10 MW MAPLE reactors and a new processing facility at the Chalk River Laboratories for one of its customers. The reactors and the processing facility, collectively known as the Dedicated Isotope Facility, were designed to produce isotopes for the health industry. The Facility was planned to be producing isotopes after a four-year development and construction period ending in November 2000.

33. In September 2005, AECL and its customer agreed to terminate the original agreement and replace it with a 40-year supply agreement dated 21 February 2006. Under the new agreement, AECL acquired the Dedicated Isotope Facility and will bear future project costs and ongoing operating costs. In return, it will receive a share of net revenues from future sales of isotopes. In the 2006–07 Summary Corporate Plan, the cost of acquiring and completing the project was estimated at about $130 million, with in-service dates of October 2008 for the first reactor and the fall of 2009 for the second reactor. At the end of March 2007, the cost estimate was revised and increased significantly.

34. In its December 2006 report on the status of AECL's Maple reactors, the Canadian Nuclear Safety Commission (CNSC) indicated that AECL had made substantial progress in its quality assurance programs for commissioning and operations. However, the rating given by the CNSC for implementation of the quality program remained a "C", or "below requirements," since the effectiveness of the completed improvements had yet to be demonstrated. In addition, AECL had not completed a number of actions from the CNSC's 2005 audit of quality assurance for the operations of the Dedicated Isotope Facility.

35. A significant risk to the successful completion of the project has been the unresolved technical issues related to operating in compliance with regulatory requirements. Understanding and resolving the technical issues is taking longer than planned. These delays have resulted in expansion of the project scope, increased cost estimates, and deferral of scheduled milestones. The project is on a tight schedule, and AECL's time margin to complete the reactors by 2008 and 2009 has been reduced. In 2006, AECL made a number of changes to strengthen its management of the Dedicated Isotope Facility. According to management, AECL remains committed to the in-service date of October 2008 as stipulated in the current agreement.

36. **Development of the Advanced CANDU Reactor.** AECL's ability to market nuclear power reactors domestically and abroad depends on its ability to fund and develop the next-generation CANDU reactor, the Advanced CANDU Reactor (ACR). Initially, AECL planned to develop an ACR 700 MW reactor for the US market with an in-service date of 2011. Market conditions changed in 2005, and to meet the Canadian market requirements the Corporation changed its design product to an ACR 1000 MW reactor, with an in-service date of 2016. Moreover, the cost estimates were revised and increased significantly. In addition to the design change, other reasons for the delays and the cost increase included more stringent licensing requirements, design enhancements to meet customer expectations, an enhanced project management and risk management approach, additional overhead, contingency planning, and allowance for cost escalation. At the end of March 2007, the Corporation had invested about $300 million in developing the ACR, of which $145 million was funding received from the government.

37. AECL recognizes that its ability to ensure that the ACR is licensable is critical to the project's commercial viability. The Corporation has been proactive in attempting to ensure that the ACR will be licensable in Canada. AECL and the Canadian Nuclear Safety

Commission (CNSC) signed a memorandum of understanding whereby the CNSC agreed that its staff would review the ACR design and issue a statement as to whether, in their view, there were no fundamental barriers that would prevent licensing of the ACR design. The CNSC cancelled this agreement effective December 2006, citing resource constraints. Regulatory agencies in some countries issue pre-licensing statements on the design of new reactors, which are used in marketing the new designs. The loss of such a statement puts AECL at a competitive disadvantage.

38. **Replacement of aging facilities at Chalk River Laboratories.** Limited funds threaten AECL's ability to manage the Canadian nuclear platform responsively and cost-effectively and to properly safeguard its assets. Some of the building infrastructure at the Chalk River Laboratories (CRL) is 50 to 60 years old, well past the end of its originally intended useful life. In our 2002 special examination, we reported that until AECL could resolve how to fund the replacement of the aging buildings, the risks to public safety were likely to increase.

39. AECL has made limited investments in its infrastructure in recent years. Over the last five years, it obtained a total of $34 million in incremental funding from the federal government to deal with urgent heath, safety, security, and environmental requirements at the Chalk River site.

40. AECL has identified a need to increase its operating and capital investment by some $600 million in the next 5 years (about $850 million in the next 10 years) to address fire and building code deficiencies as well as licensing, health, safety, and security issues at the Chalk River Laboratories site. We understand that these amounts will not be included in AECL's operating and capital budgets until the government provides direction on future funding.

41. **Conclusion.** In addition to the strategic challenges outlined above, there are circumstances that affect AECL's ability to ensure that it will have the funding to achieve its mandate. Because its mandate is not defined in an Act of Parliament, it is set out in its Corporate Plan, which the government approves annually along with the corporate budget. The Corporation does not have borrowing powers and must obtain the government's approval for certain key decisions. As at 31 March 2007, its Corporate Plan for the next five years had yet to be finalized and approved. AECL needs to resolve all these major issues in order to have reasonable assurance that it can achieve its mandate and succeed as a corporation.

42. **Recommendation.** Atomic Energy of Canada Limited, in collaboration with the government, should address these strategic challenges, monitor progress on each of them, and resolve related funding issues.

AECL's response. *AECL is the only fully integrated nuclear company in the world and has both public policy roles and commercial objectives. As part of its mandate, AECL must sustain and enhance nuclear technology and at the same time capitalize on the emerging nuclear market, attract new business, and replace some of its aging facilities, all of which require long-term financial commitments. However, because of its structure, AECL does not have access to commercial credit, and government funding for its programs is subject to annual reassessment.*

The government initiated action to address the root cause of issues regarding the structure and mandate of AECL, market acceptance of the Advanced CANDU Reactor (ACR), and immediate short-term funding requirements of the Chalk River site. Following on its May 2007 update on the Dedicated Isotope Facility (DIF) to the Board of Directors, management will provide a detailed review of the strategic, contractual, and financial issues associated with the DIF project at the September 2007 Board meeting.

AECL has well-developed management systems and practices to identify and communicate strategic issues to its Board and shareholder, and to monitor and report progress against these. AECL will continue to proactively solicit the collaboration of the shareholder for assistance in implementing long-term solutions to its strategic challenges.

Additional findings and recommendations

43. Overall, we noted that AECL has improved its practices in a number of areas since our last examination in 2002. This part of the report highlights some of these findings as well as areas for further improvement.

Governance

44. Governance includes the structures, systems, and practices for overseeing the direction and management of an organization to fulfil its mandate and achieve its objectives. A Crown corporation's Board of Directors is expected to ensure that governance roles and responsibilities are well defined and respected and that a clear governance framework is in place to protect the interests of the Corporation and its shareholder (the Government of Canada). In addition, we expected that AECL's Board of Directors would use appropriate and timely information to provide strategic direction and make governance decisions allowing AECL to achieve its expected

results and its statutory control objectives and to balance its public policy role with its commercial role.

45. Core elements of governance framework. Since our last special examination in 2002, the Board of Directors has continued to improve its governance structure, systems, and practices. Overall, we found that it has the core elements of a good governance framework. The Board has a stewardship role in the Corporation and works closely with management. It provides input into and approves the Corporation's strategic direction and validates management's identification of the Corporation's principal risks. It also reviewed succession plans for executive and senior management.

46. The Board has also made several changes to its committee structure since 2002. It now has an Audit Committee, a Human Resources and Governance Committee, and a Science and Technology Committee. It also has a Research and Development Advisory Panel of external members. Each committee has terms of reference that defines its roles and responsibilities, as do the Board as a whole, the Chair of the Board, and the Chief Executive Officer (CEO). The terms of reference are reviewed and updated regularly. We found that the Board assesses its performance regularly and conducts orientation sessions for new directors that cover both the public policy and commercial roles of AECL.

47. Consistent with good general practices, Internal Audit now reports to the Audit Committee instead of to the CEO. The Board has adopted a Code of Ethics in Business Conduct. Since 2005, the Audit Committee on the Board's behalf has reviewed the conflict-of-interest declarations of the Corporation's senior officers. It has also reviewed the Corporation's process for reporting wrongdoing.

48. Terms of office of the Board's members. According to a recent shareholder resolution, the Board of Directors may have a maximum of 17 members and a minimum of 5, including AECL's President and Chief Executive Officer. Like those of other federal Crown corporations, AECL's Board members are appointed by the Governor in Council on the recommendation of the responsible minister (in this case, the Minister of Natural Resources).

49. The Board has identified the collective skills, knowledge, and experience it requires, as well as the profile of its current membership. The Board was actively involved in providing for the Minister's consideration the names of candidates for a new Chair. It has also recommended the reappointment of the President and Chief Executive

Officer that occurred in 2005 and has reviewed his performance evaluation.

50. The *Financial Administration Act* requires that a Crown corporation's board members have staggered terms of office, where possible, to ensure that no more than one half of their terms expire in the same year. However, in 2006 the terms of two directors on AECL's Board expired; another director resigned without being replaced; and at 31 March 2007, the Board had eight members, including the President and CEO. The terms of five of the eight members will expire in 2008. Before vacancies on the Board are filled, the Human Resources and Governance Committee will need to update its analysis of the Board's composition to identify gaps in its skills profile and, as required, communicate the gaps to the Minister for consideration in appointing new members to the Board.

51. Compliance with laws and regulations. In 2006, the Corporation created the position of Chief Compliance Officer. His role is to provide assurance to the Corporation's Executive and Board that AECL activities and employees are complying with applicable laws and regulations and that the Corporation's employees, officers, and directors are acting ethically and with integrity.

52. In a recent due-diligence review of its compliance with applicable laws and regulations, AECL determined that its list of compliance requirements did not include all acts and regulations to which it is subject and that it could improve the documentation of its various compliance processes. In addition, 35 percent of respondents to an internal survey said they were not aware of the full scope of their compliance responsibilities. Management has indicated that the Chief Compliance Officer is addressing these gaps. The Chief Compliance Officer is also scheduled to provide a regular compliance report to the Audit Committee.

Strategic planning

53. Strategic planning guides what an organization is, what it does, and why it does it, with an eye to the future. It includes assessing and adjusting the organization's direction in response to a changing environment, an area where a board of directors plays an important role. The Corporate Plan ultimately guides the setting of corporate objectives and the allocation of resources, whereas the Annual Report accounts for the results achieved.

54. We reviewed the information-gathering process involved in developing AECL's Corporate Plan. We assessed whether this process considers the need for AECL to control and protect its assets and manage its resources economically and efficiently, takes into account government priorities, and is based on adequate analyses of the Corporation's operating environment and financial situation. We examined the Board's involvement in setting strategic direction. We also examined the adequacy of the approach used to communicate the Corporation's strategic direction and plans to its employees.

55. **Corporate strategic planning process.** We found that AECL's corporate strategic planning process is adequate. The Board of Directors works with senior management to set out the Corporation's strategic direction. Its direction and its Corporate Plan are based on adequate analysis of its strengths and weaknesses, the key business risks it faces, its competitors, the regulatory environment, and economic analysis of the energy sector. AECL also consults with the government throughout the planning process to ensure that the Corporate Plan takes government priorities into account.

56. AECL develops a five-year Corporate Plan that is updated annually, in compliance with Treasury Board of Canada Secretariat guidelines for preparing corporate plans, and is submitted to the Minister of Natural Resources and the Treasury Board for approval. At the end of March 2007, the latest Corporate Plan for 2007–08 to 2011–12 had not been approved. We understand that delays in completing the Corporate Plan were due to discussions with the government on funding-related issues.

57. The Corporate Plan includes key priority projects and specific deliverables that must be addressed in the first year of the Plan. The operational plans of AECL's various business units set out these deliverables further, in enough detail to guide management action.

58. These operational plans have been communicated to employees and management through various channels. For example, the strategic direction was communicated through newsletters and town hall meetings, and the corporate objectives were communicated through the process of setting performance objectives. This process enables managers to know how their own objectives fit within the objectives of their superiors and the corporate objectives.

59. The operational plans of certain business units were a collaborative effort of all of the business unit managers, further ensuring that the plans were well understood and communicated to all

employees. Most of the operational plans included specific measures to help management monitor their progress.

60. The Corporation is currently implementing an initiative called "performance excellence." This initiative is aimed at ensuring that employees are not only aware of how their objectives contribute to achieving their superiors' objectives but also how they affect those to whom they provide services, whether within or outside the Corporation. Part of the initiative's aim is also to ensure that all business units within AECL use a consistent operational planning process. It was too early to assess the results of this initiative.

Performance measurement and reporting

61. Clear measurement and reporting of performance toward objectives is essential to achieving sound management and, in a federal organization, to meeting expectations for accountability and transparency. A good performance measurement process and performance indicators should provide an overview of the results achieved and allow an organization to report on performance internally, for decision making, and externally, for accountability.

62. We reviewed how AECL establishes its performance measures and how it reports on performance internally and externally. We assessed whether the performance measures allow the Corporation to monitor the achievement of its objectives. We also assessed the reliability and accuracy of its performance measurement.

63. **Progress in developing performance measures.** We found that AECL has made progress in developing performance measures. Certain areas of the Corporation use performance measures that are well defined and aligned with their objectives. These areas include the Nuclear Laboratories business unit and internal reporting on large commercial projects.

64. In our last special examination, we noted that AECL had very few measures of outcomes and that it did not measure the performance of certain processes. Since then, it has introduced several corporate performance measures in its Corporate Scorecard to address these gaps. These include

- a measure to track the progress of waste and decommissioning projects,
- a quality assurance index, and
- measures of customer satisfaction.

65. The Board receives regular reports on the performance measures and on the progress of the key priority projects identified in the Corporate Plan. A recent Board self-assessment concluded that it was receiving adequate and timely information on performance.

66. AECL has also made significant improvements to its Annual Report since our last special examination. Its Annual Report now discusses the results of its Corporate Scorecard, presents its objectives for the upcoming year, and focuses on the most important aspects of its public policy and commercial roles.

67. **Reliability and meaningfulness of corporate performances measures.** A recent internal audit report concluded that AECL needed to improve its current processes and methodology for preparing and calculating the quality assurance index, in order to increase the reliability of this key performance measure. The report also expressed concern that the complexity of the index calculation makes it difficult to understand. Further, a recent employee survey raised concern about the understandability of some other performance measures.

68. In addition, we noted that the corporate performance measures for commercial activities do not take into consideration differences in the sizes and types of AECL's contracts. Since the Corporation has many small service contracts and only a few large, non-service, contracts, its measures largely indicate the performance of service contracts and not of large contracts.

69. Management has indicated that it is reviewing some of the corporate performance measures to see if it can simplify them and make them easier to understand.

Risk management

70. We expected that all levels of AECL would focus on risks, in order to support the fulfillment of its role, business goals, and objectives. We expected that key risks would be identified, measured, mitigated, monitored, and reported in order to be managed at a level appropriate to the nature of the business.

71. We reviewed the Corporation's risk management processes and compared them with the Treasury Board Secretariat's Integrated Risk Management Framework and other best practices of integrated risk management.

72. We found that since our last special examination, AECL has made substantial overall progress in risk management. For example, at

the project level, it uses a risk review process in acquiring or selling assets prior to negotiating and signing contracts. A Chief Risk Officer under the direction of the Vice President, Finance, has been assigned overall responsibility for risk management, including responsibility for developing and implementing an Enterprise Risk Management (ERM) Framework for AECL.

73. **Approach to integrated risk management.** Nevertheless, AECL recognizes that work on its ERM framework has just begun. The first corporate-wide risk identification sessions were held in 2006. The risks identified through this exercise were taken into consideration in the 2007–08 strategic planning exercise. However, this risk-identification exercise did not consider the Corporation's numerous risk management processes already in place throughout the organization. Furthermore there is no action plan for completing and implementing its ERM framework and aligning all of these existing processes.

74. Substantial effort, strong leadership, and direction from senior management, as well as the Board's support, will be needed to achieve the stated goal of developing an appropriate ERM framework. To that end, we suggest that the ERM framework be identified as a corporate initiative.

75. **Recommendation.** Atomic Energy of Canada Limited should align all of its risk management processes under its Enterprise Risk Management (ERM) framework. The Corporation should have an action plan to complete and implement its ERM framework. The Board should approve the plan and monitor its progress.

AECL's response. *To date, AECL has piloted a number of risk management activities in line with the Treasury Board's Integrated Risk Management Framework and Enterprise Risk Management (ERM) best practices. A draft action plan, policy, and ERM framework, currently under review by management, will be presented to the Board of Directors for approval and monitored for progress. AECL's various risk management processes will be aligned under the ERM framework and AECL will integrate ERM principles into its upcoming corporate planning cycle to support portfolio prioritization and enhanced decision-making.*

Stakeholder relations and communications

76. It is important for AECL to have appropriate systems and practices to manage relations with stakeholders, including the federal government, utilities, business partners, and regulators. The federal

government supports AECL by providing funding for its activities and by promoting the Corporation abroad.

77. Overall, we found that AECL has appropriate systems and practices to manage relations with stakeholders. However, the Corporation would benefit from having a comprehensive strategic plan for stakeholder relations to ensure that all its systems and practices for managing stakeholder relations are integrated and managed consistently.

78. Relationship with the federal government. We found that AECL senior managers have frequent contacts with the federal government, including Natural Resources Canada (NRCan), the Treasury Board Secretariat, and other central agencies to discuss the strategic challenges and other issues affecting the Corporation.

79. The Corporation also has clearly defined channels of communication with the government. For example, the Chairman of the Board usually communicates with the Minister of Natural Resources, and the CEO communicates with the Deputy Minister of NRCan. We also noted that AECL regularly sends an activity report to NRCan.

80. Relationship with regulator. AECL has taken several measures to improve its relations and communication with the Canadian Nuclear Safety Commission (CNSC). Specifically, it has created the position of Chief Regulatory Officer and increased the participation of its senior officials at CNSC hearings on AECL matters.

81. In 2006, the CNSC established a regulatory office on the Chalk River Laboratories site, as it has at all major critical nuclear facilities in Canada. This office facilitates the CNSC staff's oversight of the site and also permits more frequent interaction between CNSC and AECL representatives. Monthly meetings are held between the CNSC staff and AECL, at both the project level and the executive level, to discuss regulatory matters and emerging issues. These meetings are used to clearly define the CNSC's expectations for compliance with regulatory requirements by AECL and also to discuss the Corporation's progress in meeting these requirements.

82. AECL has documented procedures for managing its correspondence with the CNSC and its regulatory commitments, as well as procedures for reporting to the CNSC. These procedures set out clearly the roles and responsibilities of AECL officials.

83. In 2006–07, CNSC staff developed a new AECL–CNSC communication protocol in collaboration with the Corporation. The purpose of the new protocol is to reduce the risk of breakdowns in communication, which the CNSC considers to be an important risk that it needs to manage to fulfill its oversight mandate.

84. **Communications with the public.** AECL commissions public opinion research itself and through the Canadian Nuclear Association. Based on this research, on media monitoring and analysis, and on industry tracking, we found that the Corporation's media program is effectively developed, delivered, and evaluated.

85. AECL uses a wide range of communications tools and tactics, including advertising, media relations, and the Internet. It is active in the Canadian Nuclear Association, which promotes the nuclear industry in Canada. However, it does not have a strategic communications plan to guide its tools and tactics. The Corporation would benefit from an annual communications plan that would include all of its communications initiatives.

86. **Customer satisfaction**. AECL keeps track of customer satisfaction in several ways, including customer surveys and customer satisfaction questionnaires completed at the end of service projects. Given the few reactor sales and contracts in which the business development group is involved, the tracking of customer satisfaction is an informal process in which personal relations play a very important role. AECL follows up with clients on unsuccessful bids in order to learn lessons for future business proposals.

87. The 2006 survey of its Canadian customers found that AECL had made significant improvements in customer satisfaction. However, it also indicated that the Corporation had yet to demonstrate a sustained track record of successfully delivered projects.

88. **Strategic alliances.** AECL recognizes the importance of entering into partnerships to help its competitive position, and it recently signed two important alliance agreements to promote CANDU technology:

- the Team CANDU agreement (SNC-Lavalin Nuclear, GE Canada, Hitachi Canada, and Babcock and Wilcox Canada) for the Ontario market; and
- an agreement with Energy Alberta Corporation for the oil sands market.

89. AECL also leverages these alliances to identify and capitalize on opportunities for new sales of reactors and to provide services in markets other than Ontario and Alberta.

90. We expected that AECL would have a framework to identify both the opportunities and the risks of partnerships and alliances and to establish and monitor those agreements.

91. We found that it did not have such a framework; nor had the Board of Directors formally reviewed and approved the Team CANDU or Energy Alberta Corporation alliance agreements before they were finalized. The Board was nevertheless informed from time to time of these alliances and their respective activities. AECL had reviewed the background of its partners and considered the opportunities and the risks of partnering with them. Its legal department had also reviewed and approved the agreements. The Corporation ensured that the deliverables by each partner were clearly defined, and it held regular meetings with its partners to monitor the progress of the deliverables.

92. **Recommendation.** Atomic Energy of Canada Limited should establish a framework for evaluating its strategic alliances and partnerships and seek Board approval for those that are significant.

AECL's response. *AECL will revise its procedures to document a framework for evaluating its strategic alliances and partnerships and will seek Board approval for those that are significant.*

Research and development

93. **Support for existing CANDU technology.** AECL's research is currently directed at pursuing activities to support existing CANDU technology. The objectives are to understand the phenomena that can affect the safe and reliable performance of CANDU nuclear reactors and to develop new reactor technology.

94. AECL spends about $250 million annually on the operations of the Chalk River Laboratories and research for existing CANDU technology. About $100 million of this amount is provided by the government.

95. Our 2002 special examination indicated that AECL needed to review its approach to selecting and evaluating research projects for existing CANDU technology. It needed to ensure that research activities were effective and were focused on the areas of greatest risk to the safe and reliable operation of nuclear facilities.

96. We expected that AECL would prioritize its research and development activities in order to meet its obligations to support the existing CANDU technology and that it would periodically assess the relevance of its research projects. We also expected that it would have processes for using the knowledge and skills gained in its research activities to maximize the safety, quality, timeliness, and cost-effectiveness of its products and services.

97. We found that AECL had made good progress since 2002, with a planning process that makes its decision making on research and development (R&D) priorities transparent to the utilities and the government. We also found that its R&D planning and monitoring process is structured and includes stakeholder input, mechanisms to capture and report key activities and decisions, and procedures to oversee and report on progress against plans.

98. Natural Resources Canada has participated at the stakeolder meetings where AECL's R&D activities and planning are discussed. The Corporation's activities are consistent with its obligations on behalf of Canada and with its other strategic priorities.

99. The Corporation annually reassesses the value, progress, and continued relevance of selected areas of research in formal forums to which it invites technical representatives of clients and government.

100. AECL involves commercial stakeholders in its decision making on its investments in R&D for the nuclear platform. This helps to ensure that the Corporation's new technologies have commercial applications. The Corporation also uses several mechanisms to determine how satisfied major clients are with its efforts to address their technology challenges.

101. AECL has several R&D performance measures and reports that are monitored by senior management.

102. Development of the Advanced CANDU Reactor. AECL is currently working on the development of several reactors: the enhanced CANDU 6 reactor, the Advanced CANDU Reactor (ACR) and Generation IV reactors. We focused our efforts on the most significant project, the ACR.

103. We reviewed the Corporation's comprehensive business plan for the ACR development project to assess whether it addresses the economic viability of the project and whether it considers customer needs. We assessed whether AECL is using appropriate project management practices for the ACR development project. We did not

assess the reasonability of the cost estimates to complete the project or the technical feasibility of the ACR. We commented on this project in the earlier section of this report that discussed the significant deficiency; in addition, we made the observations that follow.

104. AECL has worked closely with utilities to consider their needs. It worked initially with a US utility to develop the Advanced CANDU Reactor and worked on the design of the 700 MW reactor for the US. In 2005 the US utility decided to withdraw from its joint effort with AECL to obtain a US licence for the ACR. The Corporation then decided to change its business plan for the ACR and focus on the Canadian market. It consulted Canadian utilities to determine their needs and subsequently modified its business plan from a 700 MW reactor to a 1,000 MW reactor. In late 2005, it presented the Board with a revised business plan to proceed with the ACR 1000.

105. We found that the 2005 business plan for the ACR addresses economic viability and considers market conditions. AECL used the services of experts to determine the outlook for the nuclear industry and to develop the ACR business plan.

106. **Project management practices for the ACR.** In 2004, AECL reviewed its project and risk management practices for the Advanced CANDU Reactor and made several recommendations to improve them. The Corporation has since implemented these recommendations. We found that it is now using adequate project management practices for the ACR project. Specifically, we found that the Corporation uses appropriate scheduling, risk registers, and change controls.

107. **Reporting project performance for the ACR.** We found that the Corporation reports appropriately on the status and progress of the ACR project to senior executives and the Science and Technology Committee of the Board. In addition to regular reports to the Science and Technology Committee, an ACR review team has been put in place to review progress of the work monthly.

108. Government funding of the ACR is conditional on the achievement of licensing and R&D milestones. When required, funding for this project is sought through approval by the Treasury Board and supplementary estimates. We noted some inconsistencies in the funding requests sent to the government for the ACR. In 2003–04 fiscal year, AECL identified certain milestones it would accomplish in the 2004–05 fiscal year. In reporting on the progress made in 2004–05, the Corporation did not report against those milestones and instead

indicated the progress accomplished against new milestones, with no explanation of the changes. There is a need to ensure that information provided is consistent and relevant.

Products and services management

109. The quality of project management has a direct impact on AECL's ability to deliver its products and services successfully. We assessed whether the Corporation was using sound project management practices in its commercial and decommissioning projects.

110. Our audit of project management examined how effectively and efficiently AECL manages the scope of work, the cost, the schedule, and the quality of projects and identifies and mitigates risks to the project objectives.

111. We did not review the application of project management practices for new reactors built by AECL since 2002. The only new reactor that AECL has worked on during that period is the Cernavoda 2 reactor, which is 97 percent complete and currently undergoing the last steps of licensing. We focused our efforts on refurbishment projects and services contracts.

112. We found that AECL has adopted good project management practices for its commercial projects.

113. **Refurbishment and retube projects.** Refurbishment and retube projects to remove and replace reactor components and extend the life of reactors by 25 years represented more than 60 percent of the Corporation's commercial revenues for 2006–07. AECL has signed fixed-price contracts for three projects: Bruce A Units 1 and 2 retube, Point Lepreau retube and refurbishment, and Wolsong 1 retube. The total value of these contracts is more than $1.5 billion. We reviewed the project management practices for the Bruce A project and Point Lepreau projects. Both contracts are currently on schedule and on target to meet contract completion milestones dates of April and July 2009 respectively.

114. Both projects meet the requirements for effective planning, monitoring, and control of scope, cost, schedule, and quality. Processes are in place to identify and assess project risks and assign responsibility for actions to mitigate any problems. These projects also have procurement processes in place to ensure that goods and services are delivered to meet project requirements. In addition, the projects track progress against scheduled milestones, budgets, quality requirements,

identified risks, and safety requirements, and report performance to the project team and senior AECL management.

115. Further, processes are in place to address lessons learned. Reports on lessons learned have been prepared during the execution of the Point Lepreau project to assist with ongoing and future work. A similar workshop and reporting process was initiated for the Bruce A retube project in March 2007 to benefit from experience to date.

116. **Service projects.** Service projects are shorter on average and involve smaller contracts. They also differ from contracts to refurbish existing reactors and sell new reactors, as they are primarily projects to improve production capacity, increase operating safety, and optimize the performance of reactors in operation. At any one time, more than 300 projects can be under way with an average contract value of over half a million dollars.

117. We examined two such projects and found that they met our audit criteria and had effective processes for managing human resources. However, we noted that lessons learned from previous similar projects were not integrated into these projects at the beginning, as stipulated in the Corporation's project management methodology. Although both of these projects were completed on time and on budget, other projects could benefit in the early stages from integrating lessons learned and possibly saving time and money, either by following successful practices from previous similar projects or by avoiding deficiencies and failures. We noted that about 25 percent of service projects as of November 2006 were late and/or over budget.

118. **Project management information systems.** We expected to see project management information systems that are available and usable when needed and that are designed to resist attacks and recover from failures. We met with project managers and senior management and examined critical project management information provided to them; we also met with corporate information technology (IT) personnel.

119. We assessed to what extent project management information is available or disclosed to those who have a right to know. We also reviewed the risks related to information technology that could have an impact on expected corporate results.

120. Based on our work, we concluded that project management information systems meet users' needs for timely and reliable information.

121. Marketing and business development. The future success of AECL will depend largely on its ability to sell new reactors to utilities and sign contracts to refurbish existing CANDU reactors. The success of its service business is contingent on its ability to meet the needs and expectations of existing customers.

122. We assessed the adequacy of the Corporation's marketing and business development plans. We reviewed whether they address the needs of existing customers and identify business opportunities and whether AECL appropriately monitors its performance against these plans. We also assessed whether marketing and sales plans and activities are consistent with the overall corporate direction.

123. We found that the Corporation's marketing and business development plans include analysis of the different market demands, customer needs, and threats represented by competitors. AECL analyzes specific markets and assesses whether it should enter them and sell specific products or services.

124. In 2006, AECL reorganized its marketing function. The customer relations and sales group was transferred to the service business unit, whose plans focus mainly on existing customers. The business development group is now more closely aligned with the project business unit, with efforts focused on the sale and refurbishment of reactors.

125. We also noted that the marketing and business development plans are consistent with the Corporate Plan. We found that the service business unit has developed a well-structured marketing plan, which is aligned with the Corporate Plan and in turn is supported by individual customer plans. We also noted that the business development group has a separate plan for each market. Each market plan appropriately addresses the characteristics of its specific market, whether Canadian or international. However, AECL could benefit from an overall strategic marketing plan that prioritizes various markets at which to target its efforts and that allocates resources accordingly.

126. Quality assurance. Our 2002 special examination identified a significant deficiency in quality assurance, primarily due to the inconsistent application of quality assurance processes across the Corporation. In 2002, Internal Audit also identified several quality assurance areas that needed to be strengthened.

127. AECL has undertaken various initiatives to nurture a culture of quality in the Corporation, among them the performance excellence

initiative and corporate-wide training in quality. AECL also succeeded in having the Chalk River and Sheridan Park sites certified to the ISO 9001-2000 standard of quality. In 2005, the Corporation put in place a process to address non-conformance with quality standards and to apply corrective action.

128. The Corporation's Internal Audit recently followed up to assess whether management had taken corrective action in the quality assurance that needed to be strengthened. It concluded that substantial progress had been made to address the 2002 audit observations and that the present controls in these areas were adequate. We reviewed the quality assurance manuals for major projects that we examined; we found them to be consistent with corporate quality processes and to have been applied adequately.

129. As we indicated in the section on performance measurement and reporting, the quality assurance index still needs improvement to make it more reliable and meaningful.

130. Intellectual property. As a knowledge-based organization, AECL relies for its success in large part on its intellectual property, which includes copyrights, patents, and trade secrets that it has developed over the years.

131. We expected that AECL would manage its acquired knowledge to ensure that it remains available to the Corporation as employees leave and that it would protect its intellectual property against future competition from current customers and partners. This would include having a policy on the management of knowledge and intellectual property, assessing the policy's effectiveness, and monitoring compliance with the policy.

132. The Corporation has policies that provide clear guidance to staff on the management of intellectual property. In addition, the Intellectual Property Office's methods of communicating these policies appear to be effective and efficient. The policies are closely integrated with other AECL policies.

133. In the past, AECL used more than eight different systems to keep track of intellectual property. It has now integrated its intellectual property information in one system, using a standard classification; this represents a significant improvement. Management has indicated that there is still paper documentation that needs to be entered in the new system. AECL was able to readily provide a list of its patents. However, it does not keep track of intellectual property obtained from suppliers or made available to customers through licensing agreements.

134. We found that AECL used a variety of methods to protect its intellectual property, such as reviewing research papers before they are issued and involving its legal services when it enters into contracts to ensure that it is adequately protected. AECL indicated to us that patent protection is sought where warranted.

Environment and sustainable development

135. Our 2002 special examination of AECL identified a significant deficiency in environmental management and concluded that the Corporation's environmental systems and practices needed to be considerably improved.

136. We assessed the Corporation's progress in responding to our 2002 observations as well as its systems and practices to keep track of its compliance with regulatory requirements and the conditions of its site licences. We reviewed the documentation of the Corporation's Environmental Management System and related environmental plans, monitoring programs, audits, and performance reports.

137. We also reviewed decommissioning and waste management plans, systems, and practices. We conducted a detailed review of two selected waste management and decommissioning projects and the associated project management practices, which we compared with established project management practices. Finally, we interviewed a dozen officials involved in environmental management, waste management, and decommissioning activities.

138. We expected that AECL would have identified its environmental risks at all its Canadian sites. We also expected that it would have systems and practices in place to plan, monitor, and report regularly on its environmental performance in order to meet regulatory requirements and achieve continuous improvement in this area.

139. Planning, monitoring, and reporting on the Corporation's environmental performance. We found that AECL has made considerable progress in many areas of environmental management, waste management, and decommissioning. It has modified the governance structure for environmental management to raise its profile in the organization. It has created a separate environmental protection unit and made more resources available for environmental management. AECL has also established an Environmental Panel and the position of Chief Environmental Officer. The Environmental Panel is composed of senior managers and is responsible for environmental

strategic planning overall and for the monitoring of progress against strategic and operational plans.

140. The Panel has defined strategic environmental objectives and has set targets for levels of environmental performance to be achieved by 2015. To meet these objectives, annual targets are determined and actions for achieving them are set out in an Annual Environmental Plan that is linked with the business plans of the different facilities. Progress against the annual and long-term targets is tracked through the Environmental Protection Index, which has been fully developed for the Chalk River Laboratories site and is being developed for the Whiteshell site.

141. In 2004, AECL succeeded in having the Chalk River site certified to the ISO 14 001 standard for environmental management. In 2005 and 2006, external audits of the Environmental Management System (EMS) were conducted and the certification was maintained. The Corporation's EMS meets requirements for the five main elements of an adequate EMS: environmental policy, planning, implementation and operations, checking and corrective action, and management review. In its 2006 inspection report, the Canadian Nuclear Safety Commission gave a positive opinion on the EMS and raised its rating from the 2002 inspection rating. Certification to the ISO 14001 standard is now common in the nuclear industry, and AECL would benefit from taking the necessary measures to have its other important sites certified.

142. Since 2002, AECL has identified the significant environmental risks of all its facilities at its Canadian sites and has developed a database of the risks at the Chalk River and Whiteshell sites. The database is updated annually at both sites. AECL has also extended its risk analysis beyond human health risks to include risks to other species and to elements of aquatic and terrestrial ecosystems. An Ecological Effects Review was completed in 2005; actions are under way to address the Review's recommendations and provide further information on ecological risks at the Chalk River site.

143. AECL has also made progress in identifying environmental risks associated with legacy wastes at the Chalk River site. However, more remains to be done. Nuclear activities have been carried out at the Chalk River site for over 60 years, when knowledge of risks was limited and the regulatory framework was much less stringent than the current framework. Given the long life of some radioactive elements and other chemicals, impacts of these early operations continue to this day and

must be managed according to their level of risk. This task is complicated by the loss of many records from the early decades.

144. In recent years, AECL has undertaken a project to recover as much information on legacy waste as possible and record it in an electronic database. It has also conducted some field calibration exercises to ascertain the types and quantities of radioactive wastes in certain waste management areas. Despite the progress made, the inventory of legacy waste at the Chalk River Laboratories remains incomplete; the Corporation will need to carry out more field calibration activities over the years to identify all the environmental risks at the site.

145. AECL has established adequate environmental monitoring programs at its Chalk River and Whiteshell sites. The Canadian Nuclear Safety Commission is generally satisfied with these programs but expects AECL to improve the consistency of its several groundwater monitoring programs at the Chalk River site, as required under the conditions of that site's licence.

146. The Chief Environmental Officer reports regularly to the executives and the Board of Directors on the Corporation's environmental performance and progress against annual targets.

147. Internal and external audits of the Environmental Protection Program are conducted regularly at the Chalk River site, and the Corporation prepares action plans to address areas needing improvement. Progress on these actions is tracked in a database and reported to management as part of the Environmental Protection Program's annual review. Action requests resulting from the annual program review are also tracked.

148. AECL is increasing the transparency of its operations and providing the public with better information on its environmental performance. For example, in 2006 it established a Stewardship Council at which local stakeholders can discuss their concerns about the Chalk River site. AECL also makes environmental information available on its website; however, it could improve the timeliness of this information. For example, the Corporation's Annual Environmental Performance report for 2005 was still not available to the public in March 2007.

149. Compliance with environmental requirements. AECL has systems and practices in place to monitor its compliance with environmental requirements. Accidental releases, spills, and rare instances of non-compliance with licence conditions are reported to

the CNSC and other regulatory agencies as required. We noted two instances of non-compliance with licence conditions between February and October 2006. Timely corrective action was taken to address these situations.

150. Environmental monitoring conducted by AECL demonstrated that in 2004 and 2005, radioactive emissions in effluents and into the atmosphere at both the Chalk River and Whiteshell sites were well below regulatory limits. The Corporation submitted its monitoring reports on both sites to the CNSC on time.

151. AECL maintains a Registry of Legal Requirements that includes all the relevant environmental regulations it must comply with. The Corporation tracks in a database the actions it must take in response to CNSC requests and licence conditions. The CNSC has acknowledged that the Corporation has met the environmental conditions of its Chalk River licence that had deadlines in the 2006–07 fiscal year.

152. AECL has adjusted its environmental assessment procedures and practices to meet the requirements of the *Canadian Environmental Assessment Act* and regulations, which have been in force since June 2006.

153. **Waste management and decommissioning.** AECL is responsible for decommissioning its nuclear and waste management areas. At 31 March 2007, the liability to decommission AECL facilities and manage its waste was estimated at a net present value of $2.9 billion. The federal government has committed $520 million to fund the first five years of this decommissioning plan. Natural Resources Canada and AECL signed a memorandum of understanding that sets out a framework to manage the liability associated with legacy nuclear waste, which includes all the waste produced prior to 1 April 2006. Funding is provided through Natural Resources Canada, which is responsible for ensuring that only eligible costs are reimbursed and that the funds are managed effectively. Under the current budgetary practices for Crown corporations, funding is generally approved for up to five years. Therefore, no funding has been secured for the 70-year strategy beyond 2010–11.

154. In 2005, AECL developed a Comprehensive Preliminary Decommissioning Plan for the Chalk River site to be consistent with international standards and practices and to address regulatory requirements and expectations. This plan has been accepted by the Canadian Nuclear Safety Commission as a sound basis for the eventual decommissioning of the CRL site. The Corporation also has a 10-year

waste management plan. The early phases of both these plans are being implemented, and several projects aimed at reducing nuclear liabilities at Chalk River are under way or awaiting the appropriate approvals before proceeding. These projects include the repackaging of nuclear fuel from old tile holes and its subsequent storage in specially designed above-ground buildings. These projects will help to bring the Corporation's waste management practices in line with evolving international standards.

155. AECL sets priorities for waste management and decommissioning projects every two or three years. This process involves many experts in the field and is characterized by quantitative risk-based decision making. The 2001 and 2004 exercises provided useful results. However, the process could be improved by including additional details about the criteria that the expert panel should consider when assessing each of the three general risk categories (health and safety, environment, and business impacts).

156. AECL has adequate systems and practices for managing current wastes. As already noted, the Corporation should continue to take further action to identify all related risks at the Chalk River site and complete its inventory of legacy waste.

157. **Recommendation.** Atomic Energy of Canada Limited should continue to update its decommissioning plans as needed and seek opportunities to secure funding for decommissioning and waste management beyond 2010–11.

AECL's response. *AECL will continue to update its decommissioning plan and, at the mid-term of the agreement with National Resources Canada, it will seek opportunities to secure funding for decommissioning and waste management beyond* 2010–11.

Facilities management

158. We expected that AECL would manage its facilities efficiently in order to support its program requirements, licence conditions, and maintenance of competitive advantage. The Chalk River Laboratories play a significant part in fulfilling the Corporation's role and objectives. As already noted in the discussion of the significant deficiency, the replacement of AECL's aging facilities represents a strategic challenge for the Corporation.

159. In addition, we found that AECL continues to devote considerable effort to capital asset renewal plans and maintenance. The Corporation has developed a building replacement plan for the

Chalk River Laboratories that is prioritized on the basis of licence conditions, health and safety, upkeep of existing capability, and growth of operations. This plan is also consistent with the Comprehensive Preliminary Decommissioning Plan for the Chalk River site.

160. We found that AECL was using a sound process for prioritizing replacement plans and maintaining the existing facilities. This process takes into consideration the safety risks and the continuity of operations required to support the Corporation's business strategy. Maintenance resources are organized under one management team and grouped by trade. We found that management monitors maintenance resources and backlog appropriately.

Human resources management

161. AECL recognizes in its Corporate Plan that its competitive advantage is largely rooted in its people.

162. We expected that its human resources (HR) systems and practices would be designed to provide the Corporation with the core competencies and skills needed to meet its goals and objectives economically and efficiently.

163. Since our last special examination, AECL has undertaken a wide range of HR initiatives, including large-scale recruitment, to help ensure that it has the number and kinds of people it needs to achieve its business plans and objectives. In certain areas where labour market shortages represent a significant challenge, it has found short-term solutions to help meet ongoing business commitments and corporate objectives. The Corporation is developing a long-term strategy for human resources management. The aim is to resolve current staff shortages and to identify and address the key risks and challenges that will emerge with the expected retirement of a large proportion of its workforce during a period of planned business growth.

164. All managerial staff of AECL are required to have performance objectives that are aligned with corporate objectives and priorities; these performance objectives form the basis for their accountability for results. The objective-setting process is structured to meet all of the corporate objectives. AECL is seeking to strengthen the alignment of individual work below the managerial level with corporate objectives and priorities.

165. We noted that only employees who started working with the Corporation after 2002 have signed their acknowledgement that they have read and understood the requirements of the Code of Ethics and

Business Conduct; those who started working for AECL before 2002 have not signed such an acknowledgement. In addition, management and the Board are the only employees of AECL who attest annually, in writing, to their compliance with the Code.

166. **Recommendation.** All employees of Atomic Energy of Canada Limited should annually attest that they have read the Code of Ethics and Business Conduct and are complying with it.

AECL's response. *The Code of Ethics and Business Conduct is currently distributed annually to all employees with a reminder from the Senior Vice President, Human Resources of their accountabilities under the code. All managers and Board members annually attest to compliance. We will expand the annual attestation over time to include all employees. It is anticipated that implementation of this expansion will include consultation with unions and systems development.*

Conclusion

167. As stated in our special examination opinion, we found a significant deficiency related to unresolved strategic challenges that could prevent the Corporation from achieving its mandate. Other than this exception and noting the scope limitation described in paragraph 6, we concluded that during the period under examination, the systems and practices we examined were designed and operated in a way that provided reasonable assurance to the Corporation that its assets were safeguarded and controlled, its resources were managed economically and efficiently, and its operations were carried out effectively.

168. The unresolved strategic challenges include the completion and licensing of the Dedicate Isotope Facility, development and licensability of the Advanced CANDU Reactor in time for the market requirement, and replacement of the aging facilities at the Chalk River Laboratories. We have recommended that AECL

- in collaboration with the government, address these strategic challenges, monitor progress on each of them, and resolve related funding issues.

169. Throughout this report, we also identified opportunities to enhance the quality of other systems and practices. In particular, we have recommended that AECL

- develop an action plan for implementing its enterprise risk management framework and monitoring its progress.

- establish a framework for evaluating its strategic alliances and partnerships and seek Board approval for those that are significant.
- update its decommissioning plan as needed and seek opportunities to secure funding for decommissioning and waste management beyond 2010–11.
- ensure that all employees annually attest that they have read the Code of Conduct and Business Ethics and are complying with it.

Appendix Systems and practices examined and related criteria

Governance

To maximize its effectiveness and its ability to balance public policy objectives with its commercial objectives, Atomic Energy of Canada Limited (AECL) should have a well-performing corporate governance framework that meets the expectations of best practices in board stewardship, shareholder relations, and communication with the public.

Strategic planning

The Corporation should clearly define strategic directions and specific and measurable goals and objectives to achieve its commercial and public policy mandate. Its strategic direction and goals should take into account government priorities, identified risks, and the need to control and protect its assets and manage its resources economically and efficiently.

Performance measurement and reporting

The Corporation should have identified performance indicators to measure the achievement of its mandate and statutory objectives. It should also produce reports that provide complete, accurate, timely, and balanced information for decision making and accountability reporting.

Risk management

The Corporation should have a focus on risk imbedded in its corporate culture. That focus should be pervasive at all levels of the Corporation and should support the realization of its mandate, business goals, and objectives. Risks should be identified, measured, mitigated, monitored, and reported in order to be kept within a level appropriate to the nature of the business.

Research and development

AECL should prioritize and manage its platform research and development activities to efficiently meet its obligations on behalf of Canada, including its obligation to support existing CANDU technology.

The Corporation should have processes in place to leverage knowledge and skills from its platform research for its commercial activities to maximize safety, quality, timelines, and cost-effectiveness of products and services.

AECL should cost-effectively manage the development of products that are economically viable and that take into consideration client needs.

Products and services management

AECL should manage effectively and efficiently its projects to ensure that scope, cost, schedule, and quality objectives are met and that risks are identified and mitigated to reduce threats to the project objectives.

The Corporation's support software should contribute to the effectiveness and efficiency of its activities.

AECL should have an effective framework for marketing, client relations, and sales, including sound knowledge of client and client needs and satisfaction, and appropriate alliances to increase sales and profitability.

The Corporation should ensure that the quality of its products and services meet all regulatory and stakeholder needs and those effective and consistent standards of quality are achieved.

AECL should manage its acquired knowledge to ensure that key knowledge remains available to the Corporation as employees leave and to protect its intellectual property from future competition by current clients and partners.

Environment and sustainable development

The Corporation should ensure that risks related to its environment and to its reputation are identified, mitigated, monitored, and reported as appropriate, consistent with government expectations, the Corporation's tolerance for risk, and applicable regulatory and legislation requirements.

Facilities management

AECL should manage its facilities efficiently in order to support its program requirements licence conditions and maintenance of competitive advantage.

Human resources management

Human resources should be managed in a manner that provides the Corporation with the core competencies and skills it needs to achieve its goals and objectives economically and efficiently.